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EFFLUENT CHARACTERISTICS TERTIARY WASTE TREATMENT PLANT CAMP ANGELL JOB CORPS CONSERVATION CENTER

Federal Water Pollution Control Administration
Portland, Oregon

September 1967

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TERTIARY WASTE TREATMENT PLANT
CAMP ANGELL JOB CORPS CONSERVATION CENTER

INTERIM REPORT

PR-3

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U. S. Department of the Interior
Federal Water Pollution Control Administration
Northwest Region

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EFFLUENT CHARACTERISTICS
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The Regional Engineer of the Pacific Northwest Region, U. S. Forest Service, U.S.D.A., by letter dated May 18, 1967, requested the Northwest Regional Office of the Federal Water Pollution Control Administration (FWPCA) to conduct a monitoring program of Camp Angell Job Corps Center waste treatment plant which is located approximately four miles south of Waldport, Oregon. The Federal Activities Branch of the Northwest Regional Office, FWPCA, requested that the Technical Projects Branch, Pacific Northwest Water Laboratory (PNWL), FWPCA, conduct this monitoring program. Authority for this type of assistance is contained in the President's Executive Order No. 11288.

This report summarizes the data gathered during Phase I of the program. A detailed report will be prepared upon completion of this study.

OBJECTIVES

A monitoring program has been established to determine whether this waste treatment plant is producing an effluent which meets the Forest Service's specifications. These specifications state that this plant shall have "... a final chlorinated effluent having the minimum following quality requirements:

a. 5-day BOD, ppm - less than 5
b. Coliform bacteria, MPN/100 ml - less than 2
c. Turbidity, Jackson units - less than 5
d. Color, units - less than 15
e. Odor - odorless

The above will be determined by "Standard Methods for the Examination of Water and Wastewater" by APHA-AWWA-WPCF, 12th edition.

PROCEDURES

A three phase program was established to accomplish the above objectives. Phase I was conducted during the dry season from July 24-August 8, 1967. Twenty-four hour composite samples and grab samples were taken at the locations shown on Figure 1. These samples were collected on ice, returned to the PNWL the same day, and analyzed for the parameters shown in Table 1. Phase II will consist of a series of

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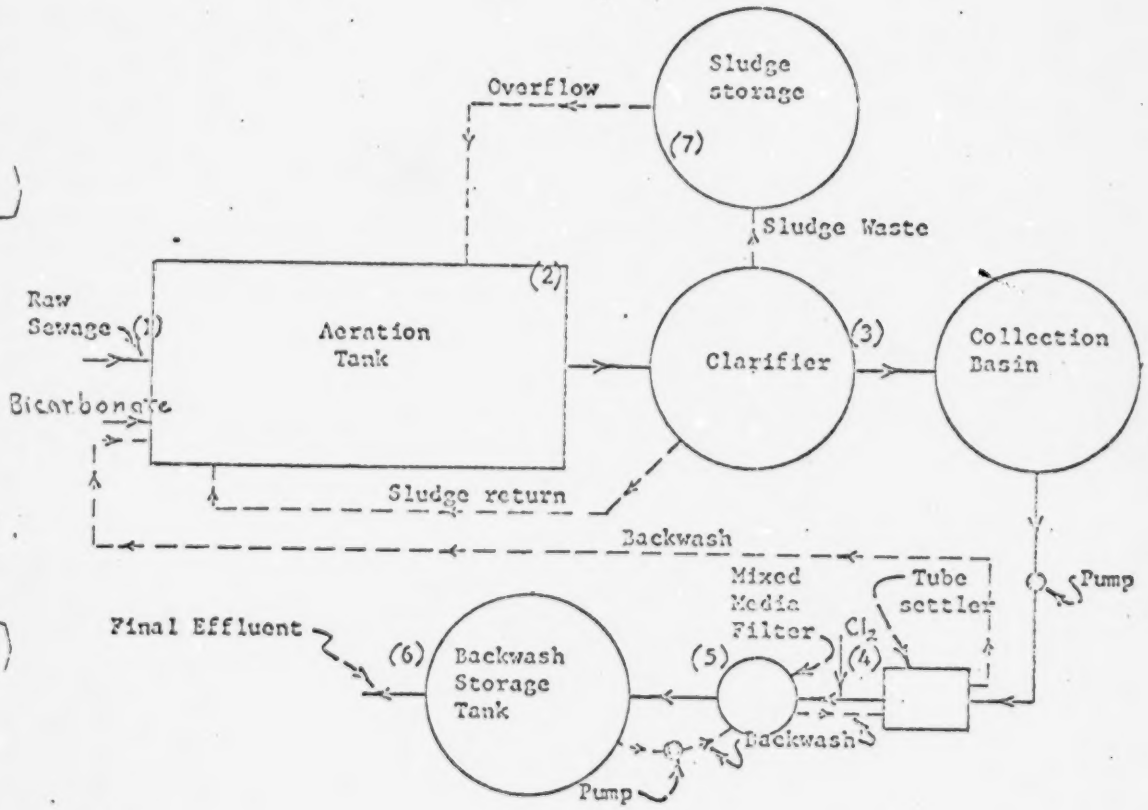

Sampling Locations:

(1) Raw Sewage
(2) Aeration Tank Contents
(3) Clarifier Effluent
(4) Tube Settler Effluent
(5) Mixed Media Filter Effluent
(6) Final Effluent
(7) Sludge Storage

FLOW DIAGRAM AND SAMPLING LOCATIONS

CAMP ANGELL SEWAGE TREATMENT PLANT

Figure I

TABLE 1

Sampling Location
Camp Angell Treatment Plant
Monitoring Program Phase I

Analytical Determinations	Raw Sewage	Aeration Tank Effluent	Clarifier Effluent	Tube Settler Effluent	Mixed Media Filter Effluent	Final Effluent	Sludge Storage
Total Solids	C	G	C	C		C	G_1
TVS	C	G	C	C		C	G_1
SS	C	G	C	C		C	G_1
TVSS	C	G	C	C		C	G_1
Turb. Jksn.(a)			C	C		C G	
Color PTCO			C		C	C	
5-day BOD	C		C			C	
COD	C		C	C	C	C	G_1
Nitrite	C		C			C	G_1
Nitrate	C		C			C	G_1
Ammonia	C		C			C	G_1
Kjeldahl N	C		C			C	G_1
Total PO_4(b)	C		C			C	G_1
Ortho PO_4(c)	C		C			C	G_1
pH	C G	G	C G			C G	G_1
Total Alk.	C G	G	C G			C	G_1
MBAS	C		C			C	
Coliform MF	G			G	G	G	
Fecal Coli. MF	G			G	G	G	
Strep. MF	G			G	G	G	

Notes: C - Daily composite sample
C - Daily grab sample
G_1 - Grab sample at random intervals

Laboratory Determinations APHA "Standard Methods," 12th edition, were used for analytical determinations with the following exceptions:

(a) Hach Turbidimeter modification.
(b) Sample is digested with sulfuric acid and potassium persulfate to convert phosphates to ortho phosphate--modification of Pacific Northwest Water Laboratory. References--Murphy, J. and Riley, J. P. Anal. Chim. Acta. 27 31 (1962). Strickland, J. D. H. and Parsons, T. R. "A Manual of Sea Water Analysis," p. 47. Bulletin No. 125, 2nd edition revised, Fisheries Research Board of Canada (1965).
(c) Modification of Pacific Northwest Water Laboratory--same reference as in (b).

grab samples to be taken semi-monthly between Phases I and III. Phase III will be similar to Phase I only conducted during January 1968 (the wet season).

RESULTS

During the two-week sampling period the treatment plant influent averaged 14,100 gallons per day. Approximately 80 percent of this average came from Camp Angell Job Corps Center with the remaining 20 percent from septic tanks located at Tillicum Beach Camp Ground. The flow rate during this period ranged from 1 to 80 gallons per minute.

Table 2 lists the individual values for coliform content on grab samples and for BOD_5, color, and turbidity on the 24-hour composites of the final effluent. The 5-day BOD ranged from 2 to 12 milligrams per liter (mg/l) with 60 percent of the values greater than or equal to ($\geq$) 5 mg/l. All of the color values were greater than 15 units with a range of 40 to 80. Turbidity of the final effluent ranged from 2 to 8 Jackson units (J.u.) with 42 percent of the values $\geq$5 J.u. Coliform values, using the membrane filter technique, showed a variation from less than 1 to 260 organisms per 100 ml. Approximately 46 percent of the values were greater than 2 organisms per 100 ml. It should be noted, though, that samples were collected in unsterile jars before transferring them to sterile bottles. All samples were reported to have a musty odor. This test was conducted at room temperature by an individual chemist and consisted of odor description only.

DISCUSSION

During Phase I of this study, the waste treatment plant was not operated according to the "Operating Instructions" manual provided by the contractor, Neptune-Microfloc. Although copies of this manual had been sent to the Forest Service, there was not one available at the treatment plant. During this two-week period, data collected by the treatment plant operator showed the pH varying from 6.0 to 7.3. Thirty percent of the values were outside the range of 6.5 to 8.5 as recommended in the manual. The operator also measured a "total chlorine" residual range of 0.2 to 1.9 mg/l. Forty percent of the values were 1.0 mg/l or less whereas, the manual calls for a "free chlorine" residual of 1.0 mg/l for disinfection only and a chlorine dosage range of 5 to 15 mg/l for color reduction. Higher chlorine dosages, besides reducing the color and coliform content, would have had a beneficial effect upon odor and BOD_5. Several other routine tests and observations covered in the manual were not followed.

TABLE 2

Final Effluent Results[a]

Date	BOD_5 mg/l	Color PTCO[b]	Turbidity Ju[c]	Coliform MF/100 ml[d]
7/25/67	-	-	-	-
7/26/67	-	65	-	-
7/27/67	11	60	6	16
7/28/67	12	60	8	< 2
7/29/67	-	80	6	< 1
7/30/67	10	60	-	82
7/31/67	5	50	6	20
8/1/67	9	60	5	< 1
8/2/67	6	60	4	88
8/3/67	4	60	3	260
8/4/67	-	60	4	< 1
8/5/67	-	60	3	6
8/6/67	4	65	4	< 1
8/7/67	4	50	2	< 1
8/8/67	2	40	2	< 2

(a) Results based on 24-hour composite samples from 11:00 a.m. to 11:00 a.m.
(b) PTCO - platinum cobalt units
(c) Ju - Jackson units
(d) Samples collected in unsterile container and transferred to sterile bottles

Odor was present in all effluent samples. However, no odor, objectionable or otherwise, was noticed in the vicinity of the plant outfall.

A grab sample of the tap water for the Job Corps Center at the treatment plant was collected on September 20 to check for color. The color was measured at 8 units, but the manager of the Southwest Lincoln County Water District said that the color of the water is lowest during this time of year. He also mentioned that the color varied considerably throughout the year.

During the two-week period of sampling covered by this report, there were 4 different men operating the Camp Angell treatment plant. Only one of these individuals had been trained by the contractor, Neptune-Microfloc. This could have influenced overall plant performance.

As provided by the contractor, the sodium bicarbonate feed pump is adequate to supply the necessary chemical dosage (capacity 25 lb/batch--required 40 or more lbs/batch. This problem can be corrected by increasing the feed pump capacity and storage volume for the sodium bicarbonate feed solution.

CONCLUSIONS

1. During Phase I of the monitoring program, the plant effluent did not meet the specifications.

2. Both the effluent color and odor requirements were exceeded in 100 percent of the samples.

3. Five-day BOD values were above the specifications in 60 percent of the samples and the coliform content exceeded that specified in 46 percent of the samples.

4. The color, odor, BOD, and coliform content could be lowered to meet specifications by increased chlorine feed. Whether this is the most economical method is yet to be decided.

APPENDIX

to

September 1967
Interim Report

on

EFFLUENT CHARACTERISTICS, TERTIARY WASTE TREATMENT PLANT, CAMP ANGELL JOB CORPS CONSERVATION CENTER

U. S. Department of the Interior
Federal Water Pollution Control Administration
Northwest Region

November 1967

ABBREVIATIONS

TS	Total Solids, mg/l
TVS	Total Volatile Solids, mg/l
SS	Suspended Solids, mg/l
VSS	Volatile Suspended Solids, mg/l
NO_2	Nitrite Nitrogen, mg/l as N
NO_3	Nitrate Nitrogen, mg/l as N
TKN	Total Kjeldahl Nitrogen, mg/l as N
NH_3	Ammonia Nitrogen, mg/l as N
T PO_4	Total Phosphate, mg/l as PO_4
O PO_4	Ortho Phosphate, mg/l as PO_4
TDOC	Total Dissolved Organic Carbon, mg/l
Alk	Total Alkalinity, mg/l as $CaCO_3$
pH	pH units
BOD_5	Five-day BOD, mg/l
COD	mg/l
MBAS	Methylene Blue Alkyl Benzene Sulfonate, mg/l
Turb	Turbidity, J.u.
Color	Platinum-cobalt units
TC	Total Coliform, No./100 ml
FC	Fecal Coliform, No./100 ml
FS	Fecal Streptococci, No./100 ml

Table 1

RAW SEWAGE (comp. with flow)

Date	TS	TVS	SS	VSS	NO_3	NO_2	TKN	NH_3	TPO_4	OPO_4	TDOC	Alk	pH	BOD_5	COD	MBAS
7-25-67	1140	710	450	440	0.6	0.001	68	47	117	75	304	249	7.4	330	888	7.4
26	860	490	400	380	0.14				148	48				340	677	
27																
28	620	350	220	210	0.08	0.007			68	55		280	8.1	220	479	3.2
29	500	230	100	80	0.17	0.01			69	58		229	7.4	260	445	1.1
30	580	330	140	140	0.22	0.01			79		200		7.9	260	498	0.9
31	500	250	140	120	0.16	0.007			86	64		232	7.8	280	372	1.7
8-1-67	510	290	130	110	0.28	0.006			81	60	169	311	7.3	230	441	2.0
2	800	260	130	110	0.14	0.003						268	7.4	240	485	5.6
3																
4	530	220	100	90	0.15	0.002			83	58	173	325	7.7		350	1.6
5	450	230	140	100	0.21	0.05			45	35	164	210	7.5		392	1.9
6	520	260	140	120	0.28	0.008			91	63		304	8.1	250	405	2.4
7	490	250	150	130	0.13	0.008			85	63		280	8.2	330	394	2.2
8	410	240	110	80	0.25	0.004			62			234	7.5	200	364	0.6

Table 2

AERATION TANK CONTENTS (grab sample)

Date	TS	TVS	SS	VSS	TKN	Alk.	pH	COD	OPO_4
7-24-67					204				
25	5570	3830	4300	3400		182	7.2		
26	5210	3550	4850	3650		146			
27	5010	3410	4950	3700		148	6.9		
28	5030	3410	4750	2950		146	6.9		
29	5260	3420	4500	3300		356	7.3		
30	5180	3480	4750	3700			6.9		
31	5140	3460	5000	3700		102	6.6		
8-1-67	5210	3570	5000	3650		83	6.4	4710	
2	5410	3600	5000	3700		163	6.8		
3	5470	3680	5150	3850		183	6.9	4250	
4	5710	3850	5300	3900		392	7.2	5090	
5	5430	3650	5200	3800		234	7.1		
6	5430	3670	5000	3700		174	6.9	4900	
7						73	6.4	5150	
8	5670	3910	5500	4050		165	6.9	5430	84

Table 3

CLARIFIER EFFLUENT (comp. w/flow)

Date	TS	TVS	SS	VSS	NO_2	NO_3	NH_3	TKN
7-25-67	773	343	20	16	.09	2.2	1.7	21
26	691	301	30	24	.03	2.9		
27	652	312	20	20	.08	2.9		
28			8	4	.05	2.2		
29	684	270	12	12	.10	3.5		
30								
31	720	304	94	94	.07	2.8		
8-1-67	672	302	52	52	.04			
2	762	366	4	4	.003	2.9		
3	806	400	4	4	.05	3.2		
4	776	406	12		.07	2.7		
5	770	340	12	12	.03	3.0		
6	790	334	12	12	.09	2.9		
7					.10	2.6		
8	622	328	8	4	.13	2.9		

Table 4

CLARIFIER EFFLUENT (comp. w/flow)

Date	OPO_4	TPO_4	pH	Alk	Turb	Color	BOD	COD	TDOC	MBAS
7-25-67	36.7	51.4	7.4	106		60	14	74	51	
26	38.5			104	9	90	17	78		
27	37.5	71.1	7.2	64	9	35	16	71		
28	71.3	70.6	7.2	82	8	80		88		
29	67.7	66.2		106	8	60		92		
30					8	80	15	83	59	.14
31	83.7	83.2	7.1	71	8	70	26	75	35	.09
8-1-67	75.7	79.4	6.9	40	6	70	12	58	25	.15
2	74.3	83.9	7.2	97	6	70	10	66		.14
3	87.6	92.7	7.4	146	4	80	8	60	46	.15
4	83.9	87.2	7.7	163	5	70		61	44	
5	83.9	82.1	7.5	144	3	70		64	45	.08
6	80.3	83.5	7.8	171	5	75	12	64		.10
7	74.5	75.7	6.9	68	4	70	11	53		.10
8	79.1	81.6	6.7	39	6	70	24	73	23	.07

Table 5

TUBE SETTLER EFFLUENT (comp. w/time)

Date	TS	TVS	SS	VSS	OPO_4	TDOC	pH	Turb.	Alk.	BOD	COD
7-24-67											
25	787	335	12	12	74	45			156		71
26	686	309	22	20				9			84
27	642	288	18	18				5			82
28	654	328	16	16				8			98
29	688	354	14	6				9		8	96
30	736	370	14	10		56	7.0	7			86
31	718	306	18	18		46		7			88
8-1-67	698	316	12	6		28		5			58
2	782	310	6	6		37		5			60
3	802	342	8	6				4			68
4	818	472	10	10				4			66
5	790	314	10	8		46		4			68
6	786	336	10	10		56		5			64
7	690	356	22	16		21		5			58
8	640	330	12	4		24		4			73

Table 6

FILTER EFFLUENT (comp. w/time)

Date	OPO_4	TDOC	Color	COD
7-24-67				
25	131	51		72
26			60	78
27			60	78
28			80	96
29			80	100
30		59	80	86
31			70	68
8-1-67		21	60	49
2			60	68
3			70	60
4			65	53
5		63	60	68
6		51	65	55
7		24	60	55
8		22	60	62

Table 7

FINAL EFFLUENT (compt. w/time)

Date	TS	TSS	SS	VSS	OPO_4	TPO_4	TOC	Color
7-24-67								
25	748	318	15	13		44	50	
26	687	298	13	12	37	73		65
27	660	287	14	13	35	72		60
28	652	300	18	16	71	72		60
29	664	256	2	8	70	69		80
30	768	376	10	10				60
31	746	308	8	12	83	82		60
8-1-67	700	306	8	6	77	78	44	60
2	736	376	12	10	74	84		60
3	834	388	8	4	89	93	45	60
4	392	172	10	10	88	90		60
5*	806	346	8	6	87	88	47	60
6	808	318	8	8	81	84		65
7	700	314	4	4	74	76		50
8					77	79		40

*Grab sample

Table 8

FINAL EFFLUENT (comp. w/time)

Date	pH	Alk.	NO_2	NO_3	Turb.	MBAS	COD	BOD
7-24-67								
25	7.6	109	0.02	2.4			72	
26		79			6		75	
27	7.3	68	.02	2.9	6		63	11
28	7.3	75	.04	3.1	8		81	12
29	7.6	117	.04	2.7	6		86	
30	7.6		.04	3.0	7	0.11	83	10
31	7.3	82	.02	3.3	6		62	5
8-1-67	6.9	45	.009		5	.16	54	9
2	7.2	88	.007	2.7	4	.16	51	6
3	7.5	142	.02	2.9	3		57	4
4	7.8	142	.02	3.0	4		55	
5*	7.6	170	.01	3.0	3	.07	70	
6	7.8	184	.02	2.8	4	.17	42	4
7	7.1	65	.009	2.7	2	.10	42	4
8	6.9	35	.002		2	.06	51	2

*Grab sample

Table 9

BACTERIOLOGICAL DATA

	Raw Sewage			Tube Settler Effluent		
Date	T.C.	F.C.	F.S.	T.C.	F.C.	F.S.
7-24-67						
25						
26						
27	20,000	10,000	<10,000	10,000	10,000	<10,000
28	90,000,000	23,000,000	>80,000,000	1,000,000	160,000	610,000
29	200,000,000	100,000,000	8,000,000	80,000	10,000	<10,000
30	17,000,000	8,600,000	1,000,000	90,000	10,000	<10,000
31	17,000,000	13,000,000	2,000,000	5,900	1,400	300
8-1-67	5,400,000	230,000	20,000	4,800	2,800	100
2	63,000,000	38,000,000	<100,000	7,000	2,200	1,000
3	22,000,000	7,500,000	500,000	52,000	16,000	100
4	48,000,000	26,000,000	2,100,000	63,000	36,000	580
5			540,000	47,000	36,000	900
6	5,800,000	3,100,000	720,000	45,000	27,000	890
7	700,000,000	270,000,000	180,000	160,000	60,000	3,000
8	28,000,000	16,000,000	200,000	190,000	61,000	1,700

Table 10

BACTERIOLOGICAL DATA

	Filter Effluent			Final Effluent		
Date	T.C.	F.C.	F.S.	T.C.	F.C.	F.S.
7-24-67						
25						
26						
27	<10,000	<10,000	<10,000	16	<2	8
28		<10,000	<10,000	< 2	< 2	< 2
29	< 200	< 200	< 200	< 1	< 1	11
30	500	40	120			19
31	< 10	< 10	< 10	20	< 2	4
8-1-67	2	< 2	40	< 1	< 1	4
2	4	< 2	10	88	< 2	2
3	26	< 2	2	260	42	< 2
4			10	< 1	< 1	6
5	22	< 1	12	6	1	11
6	< 1	< 1	6	< 1	< 1	6
7	< 1	< 1	2	< 1	< 1	1
8	< 1	< 1	1	< 2	< 1	< 1

Table 11

SLUDGE (grab sample)

Date	T.S.	TVS	SS	VSS	NO_2	NO_3	TPO_4	OPO_4	pH	Alk.	COD	TDOC	TKN
7-24-67													617
25													
26													
27													
28	16,200	11,000	15,400	10,300	.02	.45	596	124	6.9	778	14,400		
29													
30											9,960	5,830	
31	17,400	1,200	17,400	12,000	.02	.48	991	124	6.8	750	15,500	6,200	
8-1-67	17,000	11,000	17,000	11,000	.004	.22	606	139	6.8	815		5,450	
2													
3													
4	13,400	8,900	13,200	8,900	.05	.24	335	126	6.8	806	11,900	5,640	
5													
6													
7	14,600	9,590	14,200	9,550	.008	.39	558	147	6.8	859	8,490		
8	13,600	9,200	13,500	9,200	.003	.43	528	129	7.2	679	9,660	3,570	